GEOMETRY.

412. Proposed by S. LEFSCHETZ, The University of Nebraska.

To inscribe in a given circle an isosceles triangle in which the base plus the altitude is equal to a given length.

413. Proposed by D. F. KELLY, New York City.

To construct a triangle, having given the base, vertical angle and the ratio of the altitude to the difference of the other two sides.

414. Proposed by H. C. FEEMSTER, York, Neb.

To construct the cyclic quadrilateral, having given its four sides.

CALCULUS.

334. Proposed by ELMER SCHUYLER, Brooklyn, N. Y.

Solve the differential equation:

$$\frac{\partial^2 T}{\partial u \partial v} + \frac{2v}{u^2+v^2+1}\frac{\partial T}{\partial u} + \frac{2u}{u^2+v^2+1}\frac{\partial T}{\partial v} = 0.$$

335. Proposed by W. R. LEBOLD, Cambridge, Ohio.

Let $\rho = F(\theta, \phi)$ be the equation in polar coordinates of a closed surface. Show that the volume of the solid bounded by the surface is equal to the double integral.

$$\tfrac{1}{3}\int\int \rho \cos\gamma \, d\sigma$$

extended over the whole surface, where $d\sigma$ represents the element of area, and γ the angle which the radius vector makes with the exterior normal.

[Goursat-Hedrick, *Analysis*, p. 325, ex. 9.]

336. Proposed by EVA S. MAGLOTT, Ada, Ohio.

If a right cone stands on an ellipse, prove that its superficial area is

$$\frac{\pi}{2}(OA + OA')(OA \cdot OA')^{\frac{1}{2}} \sin\alpha,$$

where O is the vertex of the cone, A and A' the extremities of the major axis of the ellipse, and α is the semi-angle of the cone.

MECHANICS.

271. Proposed by B. F. FINKEL, Springfield, Mo.

A hollow spherical shell is filled with a frictionless fluid and rolls down a rough inclined plane. After rolling t seconds, the fluid suddenly solidifies. Determine the subsequent motion of the spherical shell.

272. Proposed by J. F. LAWRENCE, Stillwater, Okla.

A perfectly rough circular cylinder is fixed with its axis horizontal. A sphere is placed on it in a position of unstable equilibrium, and projected with a given velocity parallel to the axis of the cylinder. If the sphere be slightly disturbed in a horizontal direction perpendicular to the direction of the axis of the cylinder, determine at what point the sphere will leave the cylinder.

273. Proposed by F. P. MATZ, Reading, Pa.

A person is placed on a perfectly smooth surface. How may he get off?

NUMBER THEORY AND DIOPHANTINE ANALYSIS.

187. Proposed by E. T. BELL, New York, N. Y.

If m is any integer, P the product of all the distinct prime factors of m and λ their number, and if $N(x)$ denote the number of divisors of x, then